EVALUATION OF FUMIGANTS FOR PEST MANAGEMENT AND SEEDLING PRODUCTION IN SOUTHERN PINE NURSERIES

Stephen W. Fraedrich* and L. David Dwinell
USDA Forest Service, Southern Research Station, Athens, GA

The South's forest-products industry, as well as nonindustrial private landowners throughout the region, depend on forest-tree nurseries for the continuing production of high quality seedlings that survive well and grow quickly when outplanted. In recent years, southern pine nurseries have produced 1.1 to 1.65 billion seedlings annually, a production level that accounts for 69 to 78 percent of all forest-tree seedlings produced in the United States. Nursery managers have long used methyl bromide as a key component of their pest management programs to provide broad-spectrum control of weeds, disease-causing organisms, nematodes, and insects. Many managers routinely fumigate after every second pine crop, although some still employ fumigation after every crop. The successful development of future integrated pest management (IPM) programs will depend upon identifying the pest problems that will affect nursery production in the absence of methyl bromide fumigation, evaluating potential alternative fumigants and other pesticides, and determining when they are needed.

Since 1995 we have been evaluating fumigants and pest problems in forest-tree nurseries. One of the first studies was designed to compare methyl bromide fumigation and no fumigation in each of two 10-acre fields (F1 and F2) at a south Georgia nursery. The objective has been to assess the impact of no fumigation on seedling production and quality, as well as development of pest problems. We are currently into our fourth year of this study. Purple nutsedge (*Cyperus rotundus*) has been a major pest problem in nonfumigated plots, but we have not observed major disease, nematode or insect problems in study plots. In 1996, however, fewer loblolly pine seedlings were produced in nonfumigated beds in F1 as compared to fumigated beds. The difference in the seedling bed density was noted between treatments 3-4 weeks after seed sowing, and this difference persisted throughout the growing season. The reduced bed density may have been due to preemergence damping-off. In 1995 and 1997, loblolly pine seedlings were smaller in the nonfumigated plots as compared to fumigated plots in F1. In F2, seedling production and quality did not differ between nonfumigated and fumigated plots.

Studies were initiated to evaluate dazomet as a possible alternative to methyl bromide in 1996. The studies were conducted in two nurseries and the objectives have been to assess the influence of season, rate and method of dazomet application on seedling production and control of pests. No major differences in seedling production and quality have been observed; overall

seedling quality has been comparable in methyl bromide and dazomet treatments. However, dazomet failed to control purple nutsedge to the same extent as methyl bromide. No significant mortality could be attributed to disease-causing organisms, nematodes or insects.

We initiated studies at two nurseries in the fall of 1997 to evaluate the efficacy of metam sodium. Objectives have been to evaluate the season and rate of application on seedling production and quality. To date, no major differences have been observed in seedling production between metam sodium treatments and methyl bromide at either nursery. Fumigation with methyl bromide and fall application of metam sodium were both effective for weed control. No major disease, nematode or insect problems have been observed.

Evaluations of chloropicrin, applied alone or with either EPTAM or metam sodium, were also initiated for the 1998 growing season. We are also assessing the efficacy of chloropicrin/metam sodium treatments with and without tarps. At mid-season, seedling bed densities were similar among treatments and no major pest problems have been observed with the exception of weeds.

Conclusions: Weeds, particularly nutsedge, appear to be the most evident and severe pest problem in our nonfumigated study plots at this time. Although, herbicides are currently available for weed management in southern pine nurseries (South, et al. 1997), their use in controlling nutsedge has not been fully integrated into pest management systems.

We have found no major losses in our studies that can be attributed to diseases or nematodes. Information is presently lacking on the rate at which populations of disease-causing organisms and nematodes rebound in southern forest-tree nurseries following methyl bromide fumigation. Hodges (1962) stated that there was good evidence to suggest that fumigation provides good control of root diseases for 3 to 4 years. Results of our studies suggest that fumigation may be used more frequently than it is actually needed for the control of nematodes and diseases. At this time, however, there are few predictive indicators available to nursery managers to provide information on precisely when fumigation is necessary to avoid seedling losses in any particular field.

Pest problems that may affect seedling production and quality will vary from year to year among nurseries, and very likely among fields within a nursery. Although finding acceptable alternatives to methyl bromide is imperative, developing the means to adequately predict the problems that will affect seedling production is equally important. In the future, more emphasis needs to given to development of IPM programs rather than just the evaluation of broad spectrum fumigants.

Literature Cited

Hodges, C. S. 1962. Diseases in Southeastern Forest Nurseries and Their Control. USDA Forest Service. Southeastern Forest Experiment Station. Station Paper No. 142. 16pp.

South, D. B., W.A. Carey and S.A. Enebak. 1997. Chloropicrin as a soil fumigant in forest nurseries. The Forestry Chronicle 73:489-494.